

BREEDING BIRD SURVEYS IN MISSOURI'S  
FOCAL GRASSLAND LANDSCAPES  
2013 - 2016



MISSOURI RIVER  
BIRD OBSERVATORY

REPORT TO THE MISSOURI DEPARTMENT OF CONSERVATION  
JANUARY 2017





# GRASSLAND BIRD SURVEYS 2013-2016

## EXECUTIVE SUMMARY

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Front Cover: "Dickcissel  
in the Morning" by Russell  
Kinerson of Joplin, MO.

The Missouri River Bird Observatory (MRBO) has conducted annual breeding bird surveys on public and private grasslands in Missouri since 2013. These surveys began in partnership with the National Audubon Society's Audubon Conservation Ranching (ACR) program in 2012 and expanded to include public properties in Missouri's focal grassland landscapes in 2013. Surveys employ a line-transect Distance sampling methodology and are aimed at elucidating target-species population trends on Missouri's most important grasslands. MRBO also works directly with MDC Area Managers and private landowners to determine how plant communities, habitat structure, and yearly management activities influence grassland bird populations.

Over the past four years, MRBO has conducted surveys on 91 grassland properties that include Conservation Areas, State Parks, Missouri Prairie Foundation holdings and private lands involved in MDC, Audubon, and Partners for Fish and Wildlife programs. The data set resulting from these grassland bird surveys consists of 57,829 individual bird detections, which includes 37,816 detections of target species. Target species represent the guild of grassland obligate birds for surveys (page 21 provides a comprehensive list of target species and their relative conservation rank). Since 2013, we have also amassed spatial data representing exact locations of each individual bird detected. This allows us to map bird occurrence in conjunction with management information in ArcGIS Online to develop a better understanding of how management actions directly affect bird habitat use. The resulting maps enable Area Managers and landowners to plan habitat management according to the bird populations they are trying to maintain.

The 2013-2016 data represent a long-term data set that allows us to begin observing trends in grassland bird populations throughout Missouri's focal areas. These landscape-scale areas include the Upper Osage Grasslands and Grand River Grasslands Comprehensive Conservation Strategy Priority Geographies as well as the Golden Prairie, Diamond Prairie, Cole Camp and Green Ridge Conservation Opportunity Areas (COA). This report shows changes in density for 11 grassland-obligate species on properties within those regions. The data also show some overall trends in grassland bird populations throughout the state. While these observed trends do not apply to every surveyed property, the trends are representative of the grassland focal areas as a whole.

- ✦ A significant increase in grassland obligates, as a guild, was observed in 2014, followed by a significant decrease in 2015 and another increase in 2016. Net population change from 2013-2016 shows a small increase.
- ✦ The Dickcissel population exhibited the same trends as the guild. Indeed, their large numbers relative to other species likely contributed to the guild trends observed from 2013-2016. Dickcissel density has shown a very slight increase over the course of the study period.
- ✦ Eastern Meadowlark density has shown a significant increase since 2013.
- ✦ Henslow's Sparrow densities increased slightly in 2014 and 2015, followed by a very slight decrease in 2016, to result in a net increase since 2013.
- ✦ Northern Bobwhite densities have increased each year and this increase is statistically significant for the period of 2013-2016.
- ✦ Field Sparrow and Bell's Vireo densities have increased since 2013.
- ✦ The Grasshopper Sparrow population has decreased significantly each year since 2013.
- ✦ Bobolink densities have undergone a slight decrease since 2013.

This report also provides a summary of initial findings of bird response to patch-burn grazing on six Missouri prairies, as well as an overview of the extensive survey and management dataset available to all MDC staff in ArcGIS Online.

# PROJECT BACKGROUND AND METHODOLOGY



The guild of grassland-obligate birds has undergone significant declines in recent decades. The species that comprise this guild are reliable, conspicuous indicators of grassland habitat loss, alteration and quality. Since 2013, the Missouri River Bird Observatory (MRBO) has conducted line-transect Distance sampling of breeding bird populations within Missouri's focal grassland landscapes. Breeding season survey efforts during the years of 2013-2016 covered a total of roughly 170,000 grassland acres, with an average of 46,000 acres each year. Surveys have been conducted on Missouri Prairie Foundation holdings, private lands in conjunction with National Audubon Society's Audubon Conservation Ranching Program and the US Fish and Wildlife Service Partners for Fish and Wildlife Program, and private lands

enrolled in MDC Private Land Services Programs as well as a suite of MDC Conservation Areas. Combined density results derived from findings on a total of 85 Missouri properties since 2013 provides a robust indicator of year-to-year trends in populations of the state's grassland birds.

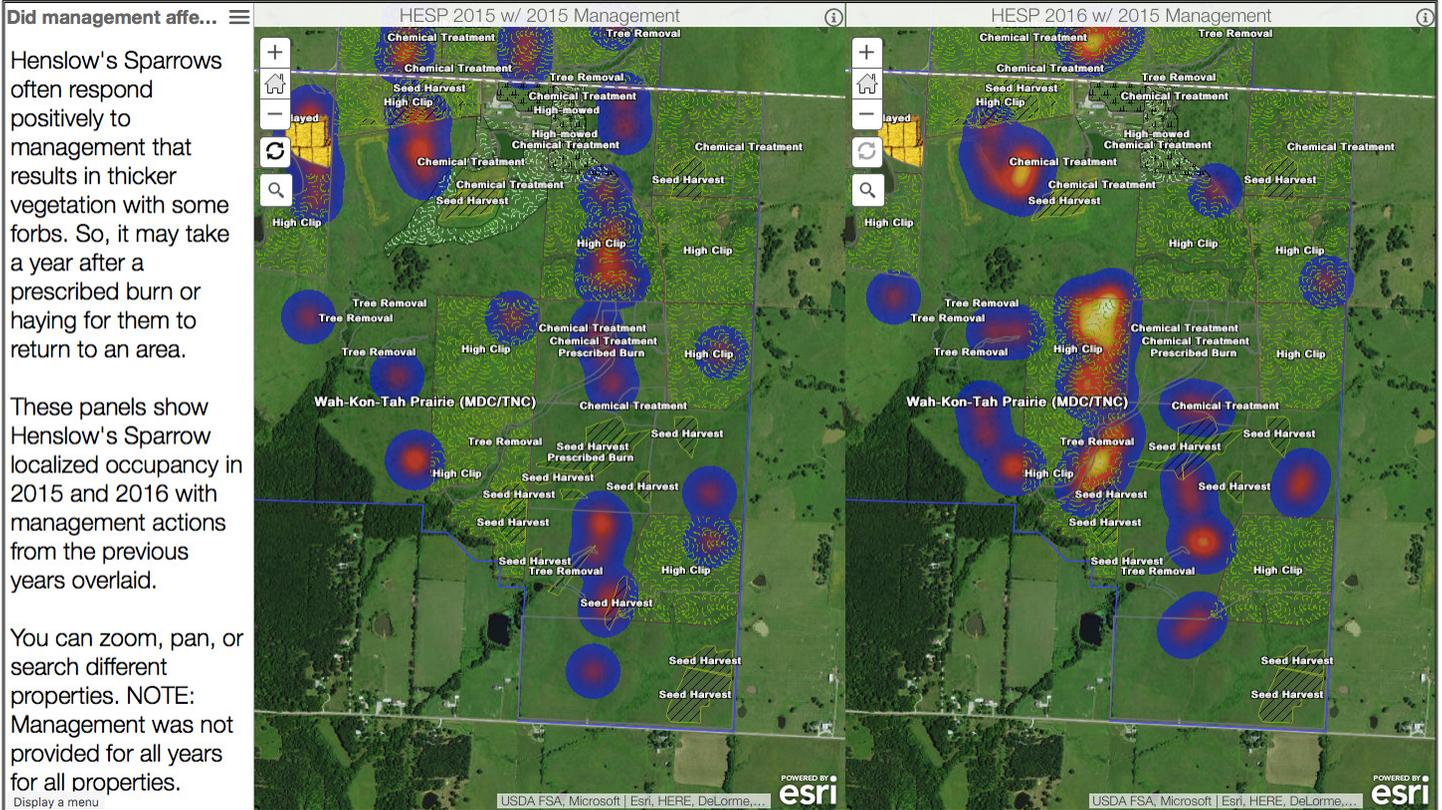
Following protocol developed by MRBO, MDC and the National Audubon Society in 2012, line-transect surveys were implemented in combination with territory mapping to document all bird species on each study site. Observers walk transect lines at approximately one mile/hour and record all birds seen and heard on an iPad using the application Collector for ArcGIS (ESRI 2016). Bird location data from iPads are uploaded daily and are accessible online at [mrbo.maps.arcgis.com](http://mrbo.maps.arcgis.com) and with ESRI Geographic Information System (GIS) ArcMap 10.4, which supports spatial mapping of all bird locations as well as automated calculations of distance from transect line for further analyses in Program Distance.

MRBO grassland bird surveys are focused on Missouri's landscapes that carry the Comprehensive Conservation Strategy (CCS) or Conservation Opportunity Area (COA) designation. Sites were selected based on their relative contribution to grassland bird populations (e.g., Wah'Kon-tah Prairie, Dunn Ranch) as well as their status as grassland restoration sites (e.g., Schell-Osage). As of 2015, the majority of focal grassland properties are on a one-year-on/one-year-off survey schedule. The exceptions to this schedule are the properties undergoing active grassland restoration and those involved in MDC's Resource Science Division long-term study of patch-burn grazing (PBG) studies, which are surveyed annually. MRBO is investigating the effects of PBG on grassland bird density on these sites in conjunction with the RSD study.

Prairie bird surveys conducted by MRBO have evolved to generate results on a range of scales, providing short-term and long-term information to those managing grassland habitats. Over the past four years, MRBO has developed a variety of ways of presenting information to managers, with the overarching objectives of landscape level monitoring coupled with addressing local management information needs. The aforementioned ArcGIS Collector tool and ArcMap interface allows for traditional long-term population trend monitoring via density estimates, but also enables fine-scale, property level spatial mapping. Data for birds, vegetative communities, and management variables are stored in one location on ArcGIS Online and are readily available to MDC Area Managers and other staff. Mapping allows for easy visualization of the effects of management actions on bird occupancy, and is useful for communicating these findings directly with the public and private landowners. The strength of this approach is that managers have real-time access to current bird monitoring data. This new approach serves both the land stewards who need to make timely decisions and the birds who rely on the habitat they provide.



# USE OF GEOSPATIAL DATA IN ARCGIS ONLINE



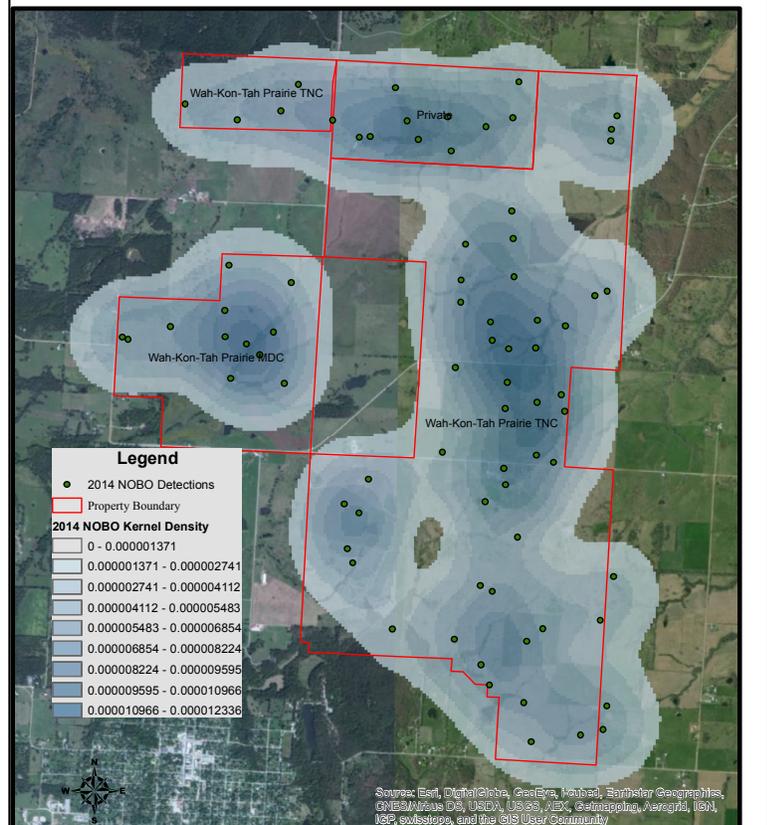
All bird detections are collected via ArcGIS Collector for iPad in the field, allowing seamless transition to ArcGIS Online (AGOL) and its various mapping features. MRBO's >50,000 grassland bird detections are available to Area Managers and other MDC staff via AGOL. Additionally, MRBO has worked with Managers to create management record layers in AGOL that can be used in conjunction with bird data to view the effects of management on bird use.

There are a nearly infinite number of map views and applications (apps) available that be created quickly in AGOL. The image above shows a typical comparison app. It contains a smooth kernel density occurrence map (heat-map) of Henslow's Sparrows in 2015 and 2016 with previous years' management actions overlaid. Managers can search any property surveyed within this app and quickly assess how management affected the distribution and number of species on the site.

Another example, below, shows a simple heat-map filtered for Northern Bobwhite Quail. This particular view in the Upper Osage Grasslands CCS illustrates the contribution of both public and private lands within that landscape.

Maps of this type can be generated for all grassland obligate species from 2013 – 2016, and the spatially-explicit bird location data can be explored in a variety of other ways. Detailed instructions are provided in a supplemental report, "A Manual for Accessing MRBO's Grassland Bird Data Using ArcGIS Online".

Northern Bobwhite Detections on Wah-Kon-Tah Prairie CA and Adjacent Private Land



# GRASSLAND BIRD USE OF PATCH-BURN GRAZE UNITS



In conjunction with the MDC Resource Science Division's (RSD) long-term patch-burn grazing (PBG) studies, MRBO initiated a parallel study to determine the effects of PBG on bird densities in 2015. The PBG study units are surveyed using the typical line-transect design but are surveyed twice each year in order to bolster sample sizes for further analysis. In 2016, MRBO initiated a nest-monitoring study on the Taberville PBG study units to investigate whether PBG may have an effect on grassland bird nest success. The results of the 2016 pilot year are available as a supplement to this report.

Initial survey findings indicate that in 2015, most species, as well as the grassland obligate guild taken as a whole, displayed higher density in the ungrazed units. In 2016, most species had a higher density in the grazed units. Here, we present results for the obligate guild and for Dickcissel and Henslow's Sparrow. The full data set for each target species is available upon request. Continued monitoring of the PBG units throughout the duration of the RSD study should further clarify the effects of PBG on bird density.

## Density of birds on patch-burned graze and ungrazed units on Conservation Areas.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance.

indicates treatment unit where density was higher, but not significantly  
 indicates treatment unit where density was significantly higher (alpha < 0.05).

Property	2015 Grazed			2015 Ungrazed			2016 Grazed			2016 Ungrazed		
	n	D	CV	n	D	CV	n	D	CV	n	D	CV
Diamond	149	1.102	0.14	200	1.593	0.11	156	1.038	0.16	155	1.011	0.11
Hi-Lonesome	118	1.084	0.1	104	0.895	0.11	171	1.423	0.22	186	1.312	0.13
Kickapoo/Providence	87	0.732	0.07	72	0.956	0.32	184	1.393	0.11	116	1.261	0.19
Taberville	121	1.357	0.15	54	1.075	0.19	185	2.266	0.02	91	0.989	0.12
Wah'Kon-Tah	75	0.841	0.07	121	1.205	0.12	105	1.059	0.06	151	1.241	0.09
All Properties	550	0.982	0.07	551	1.084	0.09	801	1.413	0.09	699	1.307	0.06

Target Species  
Guild

Property	2015 Grazed			2015 Ungrazed			2016 Grazed			2016 Ungrazed		
	n	D	CV	n	D	CV	n	D	CV	n	D	CV
Diamond	63	0.611	0.17	88	0.733	0.19	78	0.578	0.22	84	0.602	0.18
Hi-Lonesome	39	0.469	0.26	34	0.306	0.27	38	0.349	0.38	37	0.287	0.32
Kickapoo/Providence	37	0.408	0.17	41	0.569	0.3	124	1.045	0.22	89	1.063	0.25
Taberville	49	0.721	0.24	32	0.666	0.12	100	1.364	0.15	51	0.609	0.14
Wah'Kon-Tah	14	0.206	0.26	19	0.198	0.4	26	0.292	0.22	45	0.407	0.2
All properties	202	0.377	0.12	214	0.432	0.14	366	0.704	0.15	306	0.586	0.13

Dickcissel

Property	2015 Grazed			2015 Ungrazed			2016 Grazed			2016 Ungrazed		
	n	D	CV	n	D	CV	n	D	CV	n	D	CV
Diamond	16	0.145	0.55	28	0.289	0.41	22	0.163	0.56	13	0.087	0.56
Hi-Lonesome	18	0.203	0.37	15	0.162	0.49	36	0.331	0.36	42	0.304	0.36
Kickapoo/Providence	9	-	-	10	0.166	0.86	7	-	-	4	-	-
Taberville	19	0.262	0.54	9	-	-	29	0.395	0.37	10	0.112	0.51
Wah'Kon-Tah	23	0.317	0.19	33	0.411	0.14	38	0.427	0.15	35	0.295	0.17
All properties	85	0.171	0.19	96	0.221	0.2	132	0.274	0.2	104	0.228	0.23

Henslow's  
Sparrow



**Bell's Vireo (BEVI)**  
Conservation Rank: 8.

## Changes in Bell's Vireo density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year.  $\Delta$  = overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.

	indicates higher density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) higher density than previous survey year
	indicates lower density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) lower density than previous survey year

Region/COA or CCS/Property	2013			2014			2015			2016			$\Delta$
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>GLACIATED PLAINS</b>													
<i>Grand River Grasslands CCS &amp; Helton Prairie COA</i>													
Dunn Ranch	14	0.027	0.49	3	-	-	12	0.017	0.37				-0.01
Frank	1	-	-	4	-	-				3	-	-	
Helton				2	-	-	2	-	-	8	-	-	
Leuken-Hensley				0	-	-	0	-	-				
Pawnee Prairie CA	2	-	-	1	-	-	1	-	-	6	-	-	
Pawnee Prairie NA	2	-	-	3	-	-	5	-	-	8	-	-	
Poteet Farms							0	-	-	0	-	-	
Runyon							0	-	-	0	-	-	
<i>Prairie Fork COA</i>													
Prairie Fork	2	-	-							0	-	-	
<b>OSAGE PLAINS</b>													
<i>Cole Camp Prairies COA &amp; Green Ridge Focus Area</i>													
Brauer				0	-	-	1	-	-				
Bruns Tract	0	-	-	1	-	-	2	-	-				
Brysons Hope	1	-	-	0	-	-	3	-	-				
Clubine				0	-	-	0	-	-				
Drovers	0	-	-	0	-	-	0	-	-				
Friendly	0	-	-				0	-	-				
Grandfather	1	-	-				6	-	-				
Hartwell	2	-	-	2	-	-	3	-	-				
Haubein				2	-	-	2	-	-				
Hi-Lonesome	35	0.417	0.42	17	0.171	0.28	26	0.108	0.15	34	0.146	0.14	-0.271
Ionia Ridge	0	-	-	1	-	-	2	-	-				
Kearn (WR)	1	-	-	0	-	-	3	-	-				
Mora	15	0.198	0.21	11	0.123	0.27	32	0.138	0.19				-0.06
Paintbrush	7	-	-	10	0.168	0.14	23	0.152	0.24				
Shackles				0	-	-	0	-	-				

Region/COA or CCS/Property	2013			2014			2015			2016			△
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>Diamond Grove COA</b>													
Carver										1	-	-	
Diamond Grove (main unit)	2	-	-	7	-	-	8	-	-	9	-	-	
Diamond Grove (grazed unit)	0	-	-	3	-	-	3	-	-	3	-	-	
<b>Golden Grasslands COA</b>													
Coyne/Pennsylvania/Welch	0	-	-				1	-	-				
Golden	0	-	-										
Horse Creek	0	-	-				3	-	-				
Indigo	0	-	-							3	-	-	
Kickapoo	0	-	-	0	-	-	0	-	-	2	-	-	
Kremp				11	0.192	0.4	22	0.319	0.19				0.127
Niawathe	1	-	-	8	-	-	11	0.153	0.33				
Providence	3	-	-	9	-	-	13	0.136	0.26	14	0.139	0.38	0.003
Shelton	0	-	-	3	-	-	5	-	-	4	-	-	
Sloan	4	-	-	5	-	-	6	-	-				
Stony Point				25	0.126	0.31	53	0.227	0.15	49	0.252	0.13	0.126
Talbot	25	0.05	0.22				42	0.068	0.18	37	0.056	0.21	0.006
Theurer				0	-	-	0	-	-				
<b>Liberal Prairie COA</b>													
Buffalo Wallow	17	0.121	0.31	15	0.1	0.45				34	0.159	0.24	0.038
Bushwhacker	56	0.136	0.15	42	0.086	0.16				156	0.286	0.17	0.15
Clear Creek	5	-	-	36	0.329	0.24				38	0.276	0.24	-0.053
Comstock	0	-	-							12	0.159	0.23	
Drywood	0	-	-							0	-	-	
Little Osage	0	-	-							1	-	-	
Mo-No-I	2	-	-							4	-	-	
Osage	18	0.079	0.25	16	0.06	0.28				56	0.172	0.18	0.093
Redwing	2	-	-							6	-	-	
Shawnee Trails	33	0.119	0.22	81	0.166	0.17				61	0.088	0.16	-0.031
<b>Upper Osage Grasslands CCS</b>													
Francis				6	-	-	1	-	-				
Linscomb				28	0.12	0.24	11	0.078	0.31	13	0.081	0.28	-0.039
Monegaw							5	-	-	9	-	-	
Morton (Tillman tract)	9	-	-	14	0.117	0.28				13	0.094	0.3	
Schell-Osage				114	0.286	0.18	32	0.142	0.29	55	0.181	0.23	-0.105
Sewell							0	-	-	0	-	-	
Taberville	16	0.091	0.29	35	0.167	0.21	70	0.139	0.31	52	0.148	0.19	0.057
Wah'Kon-Tah	51	0.127	0.16	84	0.166	0.12	227	0.179	0.11	107	0.143	0.12	0.016
<b>All Properties</b>	<b>449</b>	<b>0.055</b>	<b>0.08</b>	<b>603</b>	<b>0.087</b>	<b>0.07</b>	<b>636</b>	<b>0.101</b>	<b>0.08</b>	<b>798</b>	<b>0.128</b>	<b>0.07</b>	<b>0.073</b>



## Changes in Dickcissel density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year.  $\Delta$  = overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color. Some data are not applicable (N/A) for 2013 as weather conditions resulted in a very late migration season, precluding accurate detections for this long-distance migrant on some properties.

	indicates higher density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) higher density than previous survey year
	indicates lower density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) lower density than previous survey year

Region/COA or CCS/Property	2013			2014			2015			2016			$\Delta$
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>GLACIATED PLAINS</b>													
<i>Grand River Grasslands CCS &amp; Helton Prairie COA</i>													
Dunn Ranch	240	0.379	0.11	465	0.774	0.06	280	0.396	0.08				0.017
Frank	169	0.385	0.12	178	0.46	0.11				145	0.256	0.12	-0.129
Helton				33	0.27	0.44	27	0.188	0.26	32	0.186	0.32	-0.084
Leuken-Hensley				78	0.638	0.32	54	0.356	0.24				-0.282
Pawnee Prairie CA	44	0.479	0.13	62	0.677	0.06	36	0.333	0.2	38	0.285	0.26	-0.194
Pawnee Prairie NA	21	0.229	0.26	59	0.644	0.21	52	0.482	0.3	37	0.248	0.2	0.019
Poteet Farms							42	0.215	0.24	37	0.156	0.3	-0.059
Runyon							12	0.324	0.2	11	0.23	0.32	-0.094
<i>Prairie Fork COA</i>													
Prairie Fork	27	0.265	0.34							6	-	-	
<b>OSAGE PLAINS</b>													
<i>Cole Camp Prairies COA &amp; Green Ridge Focus Area</i>													
Brauer				61	0.749	0.19	29	0.302	0.3				-0.447
Bruns Tract	20	0.981	0.3	17	0.835	0.3	20	0.652	0.18				-0.329
Brysons Hope	30	0.736	0.24	59	0.956	0.18	45	0.626	0.23				-0.11
Clubine				30	0.74	0.54	12	0.274	0.55				-0.466
Drovers	8	-	-	16	1.121	0.27	8	-	-				
Friendly	2	-	-				8	-	-				
Grandfather	3	-	-				21	0.755	0.05				
Hartwell	8	-	-	13	0.638	0.69	23	0.325	0.42				-0.313
Haubein				18	0.353	0.62	17	0.283	0.62				-0.07
Hi-Lonesome	57	0.559	0.3	76	0.746	0.18	90	0.365	0.19	90	0.332	0.19	-0.227
Ionia Ridge	36	0.883	0.11	41	1.007	0.03	63	0.657	0.15				-0.226
Kearn (WR)	20	0.654	0.06	54	1.326	0.12	31	0.647	0.23				-0.007
Mora	43	0.469	0.22	80	0.873	0.2	110	0.472	0.18				0.003
Paintbrush	19	0.373	0.34	43	0.704	0.15	73	0.48	0.12				0.107
Shackles				53	0.658	0.11	49	0.517	0.28				-0.141

Region/COA or CCS/Property	2013			2014			2015			2016			△
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b><i>Diamond Grove COA</i></b>													
Carver Prairie										14	0.118	0.55	
Diamond Grove (main unit)	5	N/A	-	88	0.785	0.11	178	0.7	0.11	187	0.604	0.08	-0.181
Diamond Grove (grazed unit)	19	N/A	-	64	1.572	0.03	63	0.578	0.17	78	0.587	0.17	-0.985
<b><i>Golden Grasslands COA</i></b>													
Coyne/Pennsylvania/Welch	36	0.392	0.27				83	0.693	0.18				0.301
Golden	71	0.696	0.19										
Horse Creek	5	-	-				26	0.777	0.26				
Indigo	6	-	-							5	-	-	
Kickapoo	2	N/A	-	31	1.523	0.23	41	0.57	0.27	89	1.016	0.22	-0.507
Kremp				25	0.426	0.22	24	0.347	0.34				-0.079
Niawathe	29	0.474	0.17	59	0.956	0.1	68	0.956	0.09				
Providence	9	N/A	-	50	1.637	0.14	37	0.386	0.17	124	1.062	0.18	-0.575
Shelton	57	0.932	0.15	96	1.571	0.14	77	1.085	0.13	183	2.117	0.16	1.185
Sloan	12	0.235	0.34	28	0.55	0.34	23	0.384	0.31				0.149
Stony Point				98	0.482	0.11	107	0.458	0.12	96	0.424	0.14	-0.058
Theurer				42	0.458	0.2	75	0.696	0.21				0.238
Talbot	106	0.176	0.17				75	0.122	0.2	131	0.171	0.16	-0.005
<b><i>Liberal Prairie COA</i></b>													
Buffalo Wallow	61	0.357	0.29	143	0.936	0.13				246	0.985	0.19	0.628
Bushwhacker	191	0.382	0.12	223	0.447	0.1				278	0.437	0.12	0.055
Clear Creek	21	N/A	0.42	76	0.679	0.19				104	0.648	0.23	-0.031
Comstock	6	N/A	-							29	0.331	0.45	
Drywood	0	-	-							3	-	-	
Little Osage	5	-	-							12	0.822	0.03	
Mo-No-I	31	0.76	0.23							62	0.835	0.25	0.075
Osage	127	0.461	0.13	153	0.557	0.07				252	0.664	0.11	0.203
Redwing	14	0.657	0.04							62	2.124	0.5	1.467
Shawnee Trail	248	0.737	0.08	435	0.872	0.07				685	0.85	0.09	0.113
<b><i>Upper Osage Grasslands CCS</i></b>													
Francis				10	0.491	0.6	17	0.324	0.42				-0.167
Linscomb				29	0.121	0.6	17	0.121	0.54	20	0.107	0.61	-0.014
Monegaw							45	0.828	0.1	34	0.513	0.17	-0.315
Morton (Tillman tract)	64	0.523	0.21	82	0.671	0.24				63	0.392	0.25	-0.131
Schell-Osage				94	0.231	0.47	27	0.119	0.35	34	0.096	0.32	-0.135
Sewell							49	0.569	0.16	39	0.372	0.25	-0.197
Taberville	119	0.556	0.1	220	1.029	0.09	298	0.592	0.11	380	0.929	0.13	0.373
Wah'Kon-Tah	184	0.376	0.11	361	0.695	0.09	428	0.337	0.1	324	0.371	0.11	-0.005
<b>All properties</b>	<b>3282</b>	<b>N/A</b>	<b>0.03</b>	<b>4125</b>	<b>0.557</b>	<b>0.03</b>	<b>2860</b>	<b>0.426</b>	<b>0.04</b>	<b>3952</b>	<b>0.597</b>	<b>0.05</b>	<b>0.04</b>

# EASTERN MEADOWLARK



**Changes in Eastern Meadowlark density across years in Missouri's focal grassland landscapes.**  
 n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year.  $\Delta$  = overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.

	indicates higher density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) higher density than previous survey year
	indicates lower density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) lower density than previous survey year

Region/COA or CCS/Property	2013			2014			2015			2016			$\Delta$
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>GLACIATED PLAINS</b>													
<i>Grand River Grasslands CCS &amp; Helton Prairie COA</i>													
Dunn Ranch	107	0.111	0.15	155	0.17	0.11	134	0.142	0.11				0.031
Frank	69	0.103	0.17	56	0.095	0.15				106	0.155	0.13	0.052
Helton				3	-	-	4	-	-	3	-	-	
Leuken-Hensley				11	0.059	0.26	28	0.146	0.31				0.087
Pawnee Prairie CA	17	0.121	0.36	7	-	-	27	0.188	0.27	6	-	-	
Pawnee Prairie NA	10	0.071	0.39	16	0.115	0.14	16	0.111	0.25	17	0.095	0.22	0.024
Poteet Farms							65	0.25	0.2	51	0.178	0.15	-0.072
Runyon							4	-	-	9	-	-	
<i>Prairie Fork COA</i>													
Prairie Fork	5	-	-							2	-	-	
<b>OSAGE PLAINS</b>													
<i>Cole Camp Prairies COA &amp; Green Ridge Focus Area</i>													
Brauer				24	0.194	0.19	59	0.306	0.26				0.112
Bruns Tract	3	-	-	8	-	-	29	0.711	0.27				
Brysons Hope	15	0.241	0.18	21	0.227	0.29	23	0.24	0.32				-0.001
Clubine				12	0.195	0.52	7	-	-				
Drovers	2	-	-	5	-	-	6	-	-				
Friendly	2	-	-				3	-	-				
Grandfather	1	-	-				2	-	-				
Hartwell	2	-	-	0	-	-	14	0.149	0.36				
Haubein				4	-	-	0	-	-				
Hi-Lonesome	75	0.481	0.72	22	0.142	0.26	68	0.207	0.13	78	0.238	0.122	-0.243
Ionia Ridge	8	-	-	9	-	-	40	0.314	0.12				
Kearn (WR)	6	-	-	12	0.194	0.37	19	0.298	0.14				0.104
Mora	9	-	-	13	0.093	0.51	33	0.106	0.26				
Paintbrush	6	-	-	7	-	-	20	0.099	38				
Shackles				10	0.082	0.37	23	0.182	0.24				0.1

Region/COA or CCS/Property	2013			2014			2015			2016			△
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>Diamond Grove COA</b>													
Carver										35	0.244	0.44	
Diamond Grove (main unit)	17	0.121	0.31	17	0.1	0.31	111	0.328	0.17	89	0.238	0.12	0.117
Diamond Grove (grazed unit)	7	-	-	16	0.259	0.45	41	0.263	0.2	42	0.262	0.11	0.003
<b>Golden Grasslands COA</b>													
Coyne/Pennsylvania/Welch	11	0.078	0.47				31	0.195	0.41				0.117
Golden	5	-	-										
Horse Creek	1	-	-				10	0.225	0.11				
Indigo	0	-	-							2	-	-	
Kickapoo	1	-	-	2	-	-	14	0.146	0.52	11	0.104	0.55	
Kremp				7	-	-	10	0.109	0.42				
Niawathe	5	-	-	9	-	-	13	0.136	0.28				
Providence	2	-	-	9	-	-	15	0.118	0.08	18	0.128	0.19	0.01
Shelton	12	0.128	0.32	31	0.334	0.21	13	0.138	0.19	20	0.192	0.42	0.064
Sloan	4	0.051	0.47	0	-	-	2	-	-				
Stony Point				33	0.107	0.19	46	0.148	0.2	28	0.103	0.16	-0.004
Talbot	11	0.012	0.36				19	0.023	0.31	26	0.028	0.24	0.016
Theurer				59	0.424	0.18	50	0.349	0.16				-0.075
<b>Liberal Prairie COA</b>													
Buffalo Wallow	2	-	-	12	0.052	0.31				27	0.089	0.24	0.037
Bushwhacker	38	0.049	0.23	23	0.030	0.27				51	0.066	0.27	0.017
Clear Creek	4	-	-	15	0.088	0.46				12	0.062	0.34	-0.026
Comstock	1	-	-							11	0.104	0.41	
Drywood										0	-	-	
Little Osage	0	-	-							2	-	-	
Mo-No-I	7	-	-							17	0.189	0.18	
Osage	27	0.064	0.2	31	0.074	0.16				58	0.127	0.18	0.063
Redwing	2	-	-							11	0.312	0.09	
Shawnee Trail	29	0.056	0.3	74	0.098	0.15				94	0.096	0.11	0.04
<b>Upper Osage Grasslands CCS</b>													
Francis				1	-	-	2	-	-				
Linscomb				0	-	-	2	-	-	5	-	-	
Monegaw							20	0.276	0.4	13	0.163	0.21	-0.113
Morton (Tillman)	9	-	-	23	0.124	0.26				6	-	-	
Schell-Osage				0	-	-	4	-	-	5	-	-	
Sewell							38	0.332	0.22	59	0.466	0.26	0.134
Taberville	43	0.131	0.19	61	0.188	0.18	117	0.175	0.14	124	0.251	0.14	0.12
Wah'Kon-Tah	71	0.095	0.14	139	0.176	0.14	188	0.111	0.12	126	0.119	0.13	0.024
<b>All Properties</b>	<b>1034</b>	<b>0.081</b>	<b>0.07</b>	<b>1061</b>	<b>0.098</b>	<b>0.06</b>	<b>1350</b>	<b>0.139</b>	<b>0.06</b>	<b>1210</b>	<b>0.125</b>	<b>0.06</b>	<b>0.044</b>

# FIELD SPARROW



**Field Sparrow (FISP)**  
Conservation Rank: 6.

## Changes in Field Sparrow density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year.  $\Delta$  = overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.

	indicates higher density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) higher density than previous survey year
	indicates lower density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) lower density than previous survey year

Region/COA or CCS/Property	2013			2014			2015			2016			$\Delta$
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>GLACIATED PLAINS</b>													
<i>Grand River Grasslands CCS &amp; Helton Prairie COA</i>													
Dunn Ranch	30	0.052	0.54	7	-	-	23	0.034	0.31				-0.018
Frank	38	0.095	0.23	24	0.059	0.26				12	0.024	0.36	-0.071
Helton				30	0.235	0.25	28	0.205	0.27	47	0.305	0.16	0.07
Leuken-Hensley				2	-	-	0	-	-				
Pawnee Prairie CA	7	-	-	9	-	-	10	0.098	0.36	8	-	-	
Pawnee Prairie NA	2	-	-	5	-	-	12	0.117	0.32				
Poteet Farms							18	0.097	0.34	12	0.056	0.44	-0.041
Runyon							6	-	-	5	-	-	
<i>Prairie Fork COA</i>													
Prairie Fork	27	0.291	0.29							30	0.215	0.3	-0.076
<b>OSAGE PLAINS</b>													
<i>Cole Camp Prairies COA &amp; Green Ridge Focus Area</i>													
Brauer				16	0.188	0.51	13	0.143	0.39				-0.045
Bruns Tract	1	-	-	0	-	-	1	-	-				
Brysons Hope	1	-	-	3	-	-	3	-	-				
Clubine				9	-	-	5	-	-				
Drovers	0	-	-	1	-	-	1	-	-				
Friendly	0	-	-				0	-	-				
Grandfather	3	-	-				3	-	-				
Hartwell	2	-	-	2	-	-	5	-	-				
Haubein				15	0.357	0.36	11	0.194	0.51				-0.163
Hi-Lonesome	58	0.626	0.5	7	-	-	17	0.073	0.32	27	0.111	0.33	-0.515
Ionia Ridge	0	-	-	5	-	-	4	-	-				
Kearn (WR)	0	-	-	6	-	-	0	-	-				
Mora	24	0.288	0.3	26	0.271	0.29	50	0.226	0.25				-0.062
Paintbrush	12	0.026	0.13	5	-	-	20	0.138	0.6	10	0.084	0.41	0.058
Shackles				15	0.178	0.46	5	-	-				

Region/COA or CCS/Property	2013			2014			2015			2016			△
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>Diamond Grove COA</b>													
Carver										1	-	-	
Diamond Grove (main unit)	0	-	-	0	-	-	2	-	-	2	-	-	
Diamond Grove (grazed unit)	0	-	-	0	-	-	0	-	-	0	-	-	
<b>Golden Grasslands COA</b>													
Coyne/Pennsylvania/Welch	4	-	-				4	-	-				
Golden	0	-	-										
Horse Creek	0	-	-				0	-	-				
Indigo	0	-	-							0	-	-	
Kickapoo	1	-	-	2	-	-	1	-	-	4	-	-	
Kremp				14	0.228	0.21	22	0.335	0.29				0.107
Niawathe	2	-	-	3	-	-	9	-	-				
Providence	0	-	-	0	-	-	2	-	-	5	-	-	
Shelton	1	-	-	2	-	-	1	-	-	7	-	-	
Sloan	7	-	-	5	-	-	19	0.334	0.19				
Stony Point				19	0.089	0.3	35	0.158	0.25	31	0.153	0.19	0.064
Talbot	47	0.086	0.2				106	0.181	0.14	97	0.141	0.13	0.055
Theurer				0	-	-	0	-	-				
<b>Liberal Prairie COA</b>													
Buffalo Wallow	6	-	-	10	0.062	0.41				19	0.085	0.32	0.023
Bushwhacker	21	0.046	0.26	15	0.029	0.29				61	0.107	0.17	0.061
Clear Creek	15	0.147	0.39	17	0.145	0.38				25	0.174	0.26	0.027
Comstock	6	-	-							5	-	-	
Drywood	1	-	-							1	-	-	
Little Osage	0	-	-							0	-	-	
Mo-No-I	0	-	-							1	-	-	
Osage	7	-	-	3	-	-				13	0.038	0.34	
Redwing	0	-	-							4	-	-	
Shawnee Trails	10	0.033	0.34	37	0.071	0.24				50	0.069	0.18	0.036
<b>Upper Osage Grasslands CCS</b>													
Francis				9	-	-	9	-	-				
Linscomb				55	0.219	0.2	24	0.18	0.32	18	0.108	0.24	-0.111
Monegaw							0	-	-	2	-	-	
Morton (Tillman)	11	0.099	0.35	12	0.093	39				23	0.159	0.25	0.06
Schell-Osage				95	0.223	0.15	35	0.164	0.28	58	0.183	0.18	-0.04
Sewell							0	-	-				
Taberville	2	-	-	23	0.103	0.3	27	0.056	0.24	17	0.046	0.28	
Wah'Kon-Tah	32	0.072	0.23	75	0.138	0.18	130	0.108	0.22	64	0.082	0.16	0.01
<b>All Properties</b>	<b>408</b>	<b>0.045</b>	<b>0.11</b>	<b>658</b>	<b>0.086</b>	<b>0.07</b>	<b>661</b>	<b>0.086</b>	<b>0.07</b>	<b>677</b>	<b>0.099</b>	<b>0.06</b>	<b>0.054</b>

# GRASSHOPPER SPARROW



**Grasshopper Sparrow (GRSP)**  
Conservation Rank: 6.

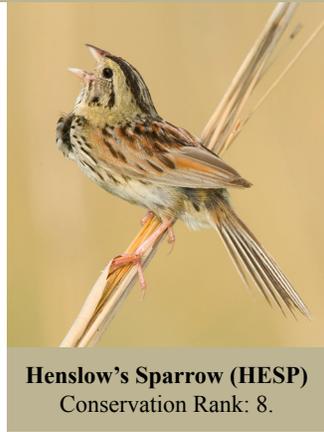
**Changes in Grasshopper Sparrow density across years in Missouri's focal grassland landscapes.**  
n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year.  $\Delta$  = overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.

	indicates higher density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) higher density than previous survey year
	indicates lower density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) lower density than previous survey year

Region/COA or CCS/Property	2013			2014			2015			2016			$\Delta$
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>GLACIATED PLAINS</b>													
<i>Grand River Grasslands CCS &amp; Helton Prairie COA</i>													
Dunn Ranch	183	0.27	0.1	197	0.279	0.11	111	0.149	0.16				-0.121
Frank	138	0.294	0.12	145	0.319	0.12				128	0.199	0.12	-0.095
Helton				2	-	-	8	-	-	13	0.067	0.54	
Leuken-Hensley				46	0.321	0.24	23	0.152	0.28				-0.169
Pawnee Prairie CA	27	0.275	0.24	17	0.158	0.34	12	0.105	0.55	3	-	-	
Pawnee Prairie NA	15	0.153	0.38	23	0.214	0.27	15	0.132	0.38	2	-	-	
Poteet Farms							84	0.408	0.19	83	0.309	0.15	-0.099
Runyon							12	0.307	0.41	2	-	-	
<i>Prairie Fork COA</i>													
Prairie Fork	1	-	-							0	-	-	
<b>OSAGE PLAINS</b>													
<i>Cole Camp Prairies COA &amp; Green Ridge Focus Area</i>													
Brauer				33	0.345	0.25	13	0.129	0.38				-0.216
Bruns Tract	4	-	-	1	-	-	0	-	-				
Brysons Hope	7	-	-	9	-	-	0	-	-				
Clubine				1	-	-	1	-	-				
Drovers	9	-	-	10	0.597	0.03	0	-	-				
Friendly	3	-	-				0	-	-				
Grandfather	0	-	-				1	-	-				
Hartwell	6	-	-	1	-	-	0	-	-				
Haubein				0	-	-	0	-	-				
Hi-Lonesome	96	0.879	0.54	12	0.1	0.24	11	0.042	0.72	12	0.039	0.65	-0.84
Ionia Ridge	9	-	-	4	-	-	0	-	-				
Kearn (WR)	1	-	-	11	0.23	0.52	4	-	-				
Mora	12	0.122	0.31	6	-	-	0	-	-				
Paintbrush	15	0.275	0.19	22	0.307	0.29	13	0.081	0.54				-0.194
Shackles				25	0.264	0.55	4	-	-				

Region/COA or CCS/Property	2013			2014			2015			2016			△
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b><i>Diamond Grove COA</i></b>													
Carver										0	-	-	
Diamond Grove (main unit)	16	0.163	0.26	21	0.159	0.37	87	0.324	0.17	22	0.062	0.26	-0.101
Diamond Grove (grazed unit)	16	0.366	0.18	9	-	-	20	0.174	0.38	11	0.073	0.17	-0.293
<b><i>Golden Grasslands COA</i></b>													
Coyne/Pennsylvania/Welch	12	0.122	0.45				37	0.293	0.3				0.171
Golden	8	-	-										
Horse Creek	2	-	-				5	-	-				
Indigo	0	-	-							0	-	-	
Kickapoo	2	-	-	3	-	-	6	-	-	6	-	-	
Kremp				10	0.145	0.74	8	-	-				
Niawathe	9	-	-	9	-	-	3	-	-				
Providence	0	-	-	1	-	-	1	-	-	2	-	-	
Shelton	8	-	-	21	0.293	0.35	15	0.2	0.56	4	-	-	
Sloan	0	-	-	0	-	-	0	-	-				
Stony Point				16	0.067	0.38	26	0.106	0.4	9	-	-	
Talbot	17	0.026	0.28				38	0.058	0.29	8	-	-	
Theurer				30	0.279	0.26	22	0.194	0.32				-0.085
<b><i>Liberal Prairie COA</i></b>													
Buffalo Wallow	4	-	-	2	-	-				0	-	-	
Bushwhacker	12	0.022	0.39	4	-	-				2	-	-	
Clear Creek	22	0.183	0.37	2	-	-				7	-	-	
Comstock	12	0.183	0.55							2	-	-	
Drywood	0	-	-							0	-	-	
Little Osage	4	-	-							0	-	-	
Mo-No-I	3	-	-							3	-	-	
Osage	37	0.126	0.21	3	-	-				6	-	-	
Redwing	1	-	-							0	-	-	
Shawnee Trails	1	-	-	0	-	-				0	-	-	
<b><i>Upper Osage Grasslands CCS</i></b>													
Francis							0	-	-				
Linscomb				2	-	-	5	-	-	3	-	-	
Monegaw							27	0.471	0.32	0	-	-	
Morton (Tillman tract)	3	-	-	19	0.132	0.4				0	-	-	
Schell-Osage				5	-	-	0	-	-	0	-	-	
Sewell							5	-	-	6	-	-	
Taberville	8	-	-	35	0.139	0.21	7	-	-	4	-	-	
Wah'Kon-Tah	17	0.032	0.36	48	0.078	0.27	59	0.044	0.26	23	0.023	29	-0.009
<b>All Properties</b>	<b>1310</b>	<b>0.139</b>	<b>0.07</b>	<b>935</b>	<b>0.117</b>	<b>0.07</b>	<b>683</b>	<b>0.094</b>	<b>0.08</b>	<b>391</b>	<b>0.054</b>	<b>0.1</b>	<b>-0.085</b>

# HENSLOW'S SPARROW



**Changes in Henslow's Sparrow density across years in Missouri's focal grassland landscapes.**  
 n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year.  $\Delta$  = overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.

	indicates higher density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) higher density than previous survey year
	indicates lower density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) lower density than previous survey year

Region/COA or CCS/Property	2013			2014			2015			2016			$\Delta$
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>GLACIATED PLAINS</b>													
<i>Grand River Grasslands CCS &amp; Helton Prairie COA</i>													
Dunn Ranch	112	0.166	0.19	116	0.207	0.15	133	0.199	0.13				0.033
Frank	40	0.086	0.36	36	0.099	0.35				56	0.093	0.35	0.007
Helton				3	-	-	0	-	-	0	-	-	
Leuken-Hensley				1	-	-	0	-	-				
Pawnee Prairie CA	8	-	-	5	-	-	45	0.441	0.19	20	0.141	0.43	
Pawnee Prairie NA	12	0.123	0.42	17	0.199	0.31	18	0.176	0.34	20	0.126	0.35	0.003
Poteet Farms							60	0.325	0.25	44	0.174	0.23	-0.151
Runyon							0	-	-	2	-	-	
<i>Prairie Fork COA</i>													
Prairie Fork	18	0.166	0.38							11	-	-	
<b>OSAGE PLAINS</b>													
<i>Cole Camp Prairies COA &amp; Green Ridge Focus Area</i>													
Brauer				1	-	-	1	-	-				
Bruns Tract	10	0.459	0.03	8	-	-	53	1.828	0.12				1.369
Brysons Hope	3	-	-	4	-	-	2	-	-				
Clubine				0	-	-	0	-	-				
Drovers	4	-	-	2	-	-	6	-	-				
Friendly	2	-	-				3	-	-				
Grandfather	0	-	-				4	-	-				
Hartwell	1	-	-	7	-	-	17	0.254	0.37				
Haubein				0	-	-	0	-	-				
Hi-Lonesome	27	0.248	0.49	58	0.609	0.13	50	0.214	0.25	85	0.294	0.22	0.046
Ionia Ridge	4	-	-	1	-	-	8	-	-				
Kearn (WR)	2	-	-	3	-	-	4	-	-				
Mora	8	-	-	5	-	-	12	0.054	0.59				
Paintbrush	12	0.221	0.43	19	0.333	0.25	19	0.132	0.35				-0.089
Shackles				25	0.332	0.38	13	0.145	0.34				-0.187

Region/COA or CCS/Property	2013			2014			2015			2016			△
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>Diamond Grove COA</b>													
Carver										2	-	-	
Diamond Grove (main unit)	8	-	-	26	0.248	0.32	58	0.241	0.28	28	0.085	0.3	
Diamond Grove (grazed unit)	1	-	-	13	0.342	0.61	16	0.155	0.55	22	0.155	0.56	
<b>Golden Grasslands COA</b>													
Coyne/Pennsylvania/Welch	5	-	-				14	0.123	0.37				
Golden	5	-	-										
Horse Creek	0	-	-				5	-	-				
Indigo	0	-	-							0	-	-	
Kickapoo	0	-	-	9	-	-	9	-	-	4	-	-	
Kremp				0	-	-	1	-	-				
Niawathe	24	0.368	0.24	23	0.403	0.37	20	0.294	0.22				
Providence	6	-	-	29	1.016	0.45	9	-	-	7	-	-	
Shelton	19	0.291	0.48	47	0.823	0.41	7	-	-	6	-	-	
Sloan	0	-	-	0	-	-	0	-	-				
Stony Point				29	0.152	0.31	24	0.109	0.35	22	0.091	0.35	-0.061
Talbot	0	-	-				0	-	-	0	-	-	
Theurer				38	0.444	0.41	16	0.157	0.35				-0.287
<b>Liberal Prairie COA</b>													
Buffalo Wallow	2	-	-	31	0.217	0.43				50	0.188	0.4	
Bushwhacker	26	0.048	0.3	30	0.064	0.27				28	0.041	0.29	-0.007
Clear Creek	12	0.1	0.49	23	0.219	0.56				37	0.216	0.43	0.116
Comstock	0	-	-							6	-	-	
Drywood	0	-	-										
Little Osage	0	-	-							1	-	-	
Mo-No-I	6	-	-							14	0.177	0.75	
Osage	32	0.109	0.24	22	0.086	0.23				43	0.106	0.28	-0.003
Redwing	0	-	-							6	-	-	
Shawnee Trails	11	0.031	0.43	4	-	-				5	-	-	
<b>Upper Osage Grasslands CCS</b>													
Francis				0	-	-	1	-	-				
Linscomb				4	-	-	6	-	-	1	-	-	
Monegaw							20	0.389	0.35	22	0.312	0.19	-0.077
Morton (Tillman)	6	-	-	16	0.14	0.42				14	0.081	0.48	
Schell-Osage				3	-	-	8	-	-	6	-	-	
Sewell							4	-	-	6	-	-	
Taberville	51	0.223	0.17	120	0.601	0.2	128	0.269	0.17	148	0.399	0.21	0.176
Wah'Kon-Tah	64	0.123	0.17	164	0.338	0.19	260	0.216	0.1	186	0.199	0.15	0.076
<b>All Properties</b>	<b>652</b>	<b>0.069</b>	<b>0.08</b>	<b>1024</b>	<b>0.128</b>	<b>0.08</b>	<b>1055</b>	<b>0.145</b>	<b>0.06</b>	<b>904</b>	<b>0.126</b>	<b>0.08</b>	<b>0.057</b>

# NORTHERN BOBWHITE



**Northern Bobwhite (NOBO)**  
Conservation Rank: 7.

## Changes in Northern Bobwhite density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year.  $\Delta$  = overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color.

	indicates higher density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) higher density than previous survey year
	indicates lower density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) lower density than previous survey year

Region/COA or CCS/Property	2013			2014			2015			2016			$\Delta$
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>GLACIATED PLAINS</b>													
<i>Grand River Grasslands CCS &amp; Helton Prairie COA</i>													
Dunn Ranch	13	0.009	0.38	51	0.038	0.17	52	0.045	0.2				0.036
Frank	19	0.019	0.3	11	0.013	0.39				21	0.028	0.36	0.009
Helton				6	-	-	13	0.055	0.23	22	0.096	0.24	
Leuken-Hensley				5	-	-	6	-	-				
Pawnee Prairie CA	5	-	-	10	0.049	0.35	5	-	-	3	-	-	
Pawnee Prairie NA	0	-	-	9	-	-	5	-	-	12	0.061	0.41	
Poteet Farms							8	-	-	26	0.083	0.23	
Runyon							4	-	-	2	-	-	
<i>Prairie Fork COA</i>													
Prairie Fork	1	-	-							8	-	-	
<b>OSAGE PLAINS</b>													
<i>Cole Camp Prairies COA &amp; Green Ridge Focus Area</i>													
Brauer				3	-	-							
Bruns Tract	0	-	-	3	-	-	18	0.356	0.36				
Brysons Hope	1	-	-	5	-	-	15	0.127	0.57				
Clubine				2	-	-	4	-	-				
Drovers	0	-	-	1	-	-	1	-	-				
Friendly	0	-	-				0	-	-				
Grandfather	0	-	-				3	-	-				
Hartwell	2	-	-	2	-	-	8	-	-				
Haubein				2	-	-	1	-	-				
Hi-Lonesome	1	-	-	9	-	-	13	0.032	0.16	55	0.152	0.17	
Ionia Ridge	4	-	-	8	-	-	24	0.152	0.25				
Kearn (WR)	0	-	-	4	-	-	4	-	-				
Mora	3	-	-	6	-	-	16	0.042	0.29				
Paintbrush	0	-	-	5	-	-	8	-	-				
Shackles				3	-	-	6	-	-				

Region/COA or CCS/Property	2013			2014			2015			2016			△
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>Diamond Grove COA</b>													
Carver										0	-	-	
Diamond Grove (main unit)	1	-	-	8	-	-	6	-	-	8	-	-	
Diamond Grove (grazed unit)	0	-	-	3	-	-	6	-	-	0	-	-	
<b>Golden Grasslands COA</b>													
Coyne/Pennsylvania/Welch	0	-	-				2	-	-				
Golden	0	-	-										
Horse Creek	0	-	-				1	-	-				
Indigo	0	-	-							0	-	-	
Kickapoo	1	-	-	0	-	-	0	-	-	0	-	-	
Kremp				3	-	-	11	0.096	0.29				
Niawathe	1	-	-	10	0.074	0.4	4	-	-				
Providence	1	-	-	2	-	-	10	0.063	0.12	14	0.09	0.19	
Shelton	0	-	-	12	0.088	0.47	3	-	-	2	-	-	
Sloan	2	-	-										
Stony Point				11	0.024	0.41	28	0.073	0.24	11	0.037	0.25	0.013
Talbot	4	-	-				8	-	-	16	0.016	0.3	
Theurer				3	-	-	2	-	-				
<b>Liberal Prairies COA</b>													
Buffalo Wallow	0	-	-	8	-	-				11	0.033	0.38	
Bushwhacker	6	-	-	11	0.009	0.35				55	0.065	0.16	
Clear Creek	1	-	-	5	-	-				13	0.061	0.3	
Comstock	0	-	-							5	-	-	
Drywood	0	-	-							0	-	-	
Little Osage	0	-	-							1	-	-	
Mo-No-I	0	-	-							1	-	-	
Osage	5	-	-	7	-	-				37	0.073	0.2	
Redwing	0	-	-							2	-	-	
Shawnee Trails	9	-	-	33	0.029	0.19				40	0.037	0.25	
<b>Upper Osage Grasslands CCS</b>													
Francis				10	-	-	3	-	-				
Linscomb				4	-	-	6	-	-	2	-	-	
Monegaw							2	-	-	2	-	-	
Morton (Tillman)	3	-	-	15	0.055	0.24				3	-	-	
Schell-Osage				18	0.019	0.46	0	-	-	2	-	-	
Sewell							1	-	-	2	-	-	
Taberville	0	-	-	15	0.032	0.32	22	0.026	0.28	20	0.037	0.32	
Wah'Kon-Tah	13	0.012	0.33	64	0.056	0.11	96	0.046	0.13	55	0.047	0.17	0.035
<b>All Properties</b>	<b>183</b>	<b>0.012</b>	<b>0.1</b>	<b>402</b>	<b>0.03</b>	<b>0.08</b>	<b>436</b>	<b>0.036</b>	<b>0.08</b>	<b>455</b>	<b>0.038</b>	<b>0.08</b>	<b>0.026</b>

# UPLAND SANDPIPER

## Changes in Upland Sandpiper density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year.  $\Delta$  = overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color. The range of the Upland Sandpiper potentially includes all COAs and CCSs surveyed but it is rarely encountered. The table below includes all Missouri properties where Upland Sandpipers were detected in 2013 - 2016 surveys.



indicates higher density than previous survey year, but difference is not significant
indicates significantly (alpha < 0.05) higher density than previous survey year
indicates lower density than previous survey year, but difference is not significant
indicates significantly (alpha < 0.05) lower density than previous survey year

COA or CCS/Property	2013			2014			2015			2016			$\Delta$
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b><i>Cole Camp Prairies COA &amp; Green Ridge Focus Area</i></b>													
Brysons Hope	14	0.28	0.31	3	-	-	3	-	-				
Hi-Lonesome	3	-	-	1	-	-	15	0.051	0.48	16	0.032	0.6	
Ionia Ridge	3	-	-	3	-	-	4	-	-				
<b><i>Grand River Grasslands CCS</i></b>													
Dunn Ranch	11	0.014	0.45	65	0.068	0.24	23	0.027	0.28				0.013
Frank	0	-	-	0	-	-				2	-	-	
Leuken-Hensley				5	-	-	1	-	-				
Pawnee Prairie NA	0	-	-	1	-	-	0	-	-	0	-	-	
<b><i>Golden Grasslands COA</i></b>													
Horse Creek	0	-	-				3	-	-				
Shelton	0	-	-	0	-	-	2	-	-	0	-	-	
Theurer				6	-	-	7	-	-				
<b><i>Liberal Prairie COA</i></b>													
Shawnee Trails	0	-	-	1	-	-				0	-	-	
<b>All Properties</b>	<b>31</b>	<b>0.009</b>	<b>0.15</b>	<b>89</b>	<b>0.009</b>	<b>0.21</b>	<b>58</b>	<b>0.007</b>	<b>0.22</b>	<b>18</b>	<b>0.002</b>	<b>0.41</b>	<b>-0.007</b>



The Upland Sandpiper requires a continuum of vegetation structure during the nesting season, from short, sparse grass for foraging to taller, thicker stands for nesting. Grazing by cattle or bison can help provide the necessary suite of vegetative structure for this species.



# BOBOLINK



**Bobolink (BOBO)**  
Conservation Rank: 7.

## Changes in Bobolink density across years in northern Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year.  $\Delta$  = overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color. In Missouri, Bobolink breed only in the northern part of the state; they are passage migrants in the remainder.

	indicates higher density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) higher density than previous survey year
	indicates lower density than previous survey year, but difference is not significant
	indicates significantly (alpha < 0.05) lower density than previous survey year

Grand River Grasslands CCS & Helton Prairie COA	2013			2014			2015			2016			$\Delta$
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
Dunn Ranch	350	0.43	0.12	498	0.75	0.1	373	0.714	0.12				0.284
Frank	233	0.412	0.13	208	0.486	17				161	0.449	0.21	0.037
Helton				0	-	-	0	-	-	0	-	-	
Leuken-Hensley				41	0.304	0.4	44	0.414	0.25				0.11
Pawnee Prairie CA	24	0.203	0.3	29	0.286	0.31	32	0.402	0.25	29	0.344	0.4	0.141
Pawnee Prairie NA	10	0.085	0.38	38	0.375	0.52	6	-	-	9	-	-	
Poteet Farms							21	0.146	0.47	26	0.174	0.54	0.028
Runyon							3	-	-	0	-	-	
<b>All Properties</b>	<b>689</b>	<b>0.087</b>	<b>0.11</b>	<b>973</b>	<b>0.144</b>	<b>0.11</b>	<b>480</b>	<b>0.078</b>	<b>0.14</b>	<b>444</b>	<b>0.074</b>	<b>0.2</b>	<b>-0.013</b>

# SEDGE WREN



**Sedge Wren (SEWR)**  
Conservation Rank: 4.

## Changes in Sedge Wren density across years in Missouri's focal grassland landscapes.

n = total number of observations during transect surveys. D = estimated density in birds/acre generated by Program Distance based on pooled data from all survey years and locations. Density calculated only if n > 10 for a property. CV = coefficient of variance. If no n, D or CV values are presented, the property was not surveyed in that year.  $\Delta$  = overall change in density from first survey year to last survey year. If no value is presented, data were not sufficient to calculate density in one or more years, but suggested trends are indicated by color. The breeding range of the Sedge Wren includes northern and central Missouri. It is a highly nomadic species that typically undergoes two nesting cycles each breeding season, often moving long distances between cycles.

COA or CCS/Property	2013			2014			2015			2016			$\Delta$
	n	D	CV	n	D	CV	n	D	CV	n	D	CV	
<b>Cole Camp Prairies COA &amp; Green Ridge Focus Area</b>													
Hi-Lonesome	0	-	-	0	-	-	0	-	-	4	-	-	
<b>Grand River Grasslands CCS</b>													
Dunn Ranch	47	0.071	0.38	20	0.023	0.36	44	0.068	0.032				-0.003
Frank	2	-	-	0	-	-				21	0.038	0.48	
Pawnee Prairie CA	2	-	-	0	-	-	2	-	-	11	0.085	0.33	
Pawnee Prairie NA	3	-	-	2	-	-	5	-	-	47	0.325	0.21	
Poteet Farms							0	-	-	2	-	-	
<b>Liberal Prairie COA</b>													
Shawnee Trails	0	-	-	5	-	-				1	-	-	
<b>All Properties</b>	<b>56</b>	<b>0.006</b>	<b>0.33</b>	<b>36</b>	<b>0.004</b>	<b>0.26</b>	<b>57</b>	<b>0.007</b>	<b>0.27</b>	<b>88</b>	<b>0.01</b>	<b>0.24</b>	<b>0.004</b>

# UNCOMMON AND DECLINING SPECIES

There are several species considered grassland-obligate target species by MRBO and the MDC that have been extremely uncommon on 2013 - 2016 surveys. While readers of this report are aware of the scarcity of Greater Prairie-Chicken, the low numbers of Loggerhead Shrike and Common Nighthawk may be surprising. Below we provide observational data for each species as detected during transect surveys as well as opportunistically during the survey season.

## GREATER PRAIRIE-CHICKEN



**Greater Prairie-Chicken (GRPC)**  
Conservation Rank: 10.

	2013	2014	2015	2016
On Transect	0	12	14	8
Off Transect	0	7	10	5
Total	0	19	24	13

Greater Prairie-Chickens have been detected on Dunn Ranch, the Frank Ranch, Poteet Farms and Pawnee Prairie in the Grand River Grasslands CCS, on Taberville and Wah'Kon-Tah Prairies in the Upper Osage Grasslands CCS, and near Wade & June Shelton Memorial Conservation Area.

## LOGGERHEAD SHRIKE

	2013	2014	2015	2016
On Transect	2	12	7	2
Off Transect	0	12	12	4
Total	2	24	19	2

Loggerhead Shrikes have been detected on Dunn Ranch, the Leuken-Hensley Ranch, the Frank Ranch and Poteet Farms in the Grand River Grasslands CCS, on Hi Lonesome Prairie and Ionia Ridge in the Cole Camp Prairies COA, on Wah'Kon-Tah Prairie and the Morton property in the Upper Osage Grasslands CCS, and on the Theurer Ranch in the Golden Grasslands CCS.



**Loggerhead Shrike (LOSH)**  
Conservation Rank: 9.

## COMMON NIGHTHAWK



**Common Nighthawk (CONI)**  
Conservation Rank: 8.

	2013	2014	2015	2016
On Transect	0	6	0	4
Off Transect	0	0	0	0
Total	0	6	0	4

The Common Nighthawk was historically a bird of the prairies, old fields and traditional farmsteads. It is now very scarce in Missouri during breeding season and most often found in towns. This species has been documented at Diamond Grove, Osage Prairie, Shawnee Trail, Stony Point and Talbot. It is still relatively abundant on private ranches in eastern Kansas.

# TARGET SPECIES CONSERVATION RANKING

The following table describes the basis for conservation value scores for each of the Missouri grassland-obligate species.

Species: Common Name

MRBO Rank: Overall conservation score for each target species based on the following criteria.

Justification: Comments on assessment.

ABC: American Bird Conservancy ([abcbirds.org](http://abcbirds.org))

Jacobs Rank: Based on Missouri Department of Conservation Wildlife Ecologist, Brad Jacobs (retired), opinion.

BBS: Breeding Bird Survey trend (<https://www.pwrc.usgs.gov/bbs/>) all years and recent years, in Missouri and for the Eastern Tallgrass Prairie Region.

	MRBO rank	Justification	ABC rank	Jacobs rank	BBS trend MO 1966-2012	BBS trend MO 2002-2012	BBS trend ETGP
Greater Prairie-Chicken	10	<100 remaining in Missouri	16	1	not given	not given	-5
Loggerhead Shrike	9	extreme declines in region & state; declines obvious to MO observers	13	3	-6.99	-8.5	-5.71
Henslow's Sparrow	8	high ABC rank, MO is range core; but, marked increases in region & state	16	2	8.44	9.82	3.64
Bell's Vireo	8	high ABC rank, neg trend in MO, MO is range core; but, shrub habitat not rare.	16	5	-1.73	-0.32	-0.6
Common Nighthawk	8	rare in natural habitat (common only in MO towns), high ABC rank, rangewide declines	15	not rated	1.01	1.31	-1.12
Bobolink	7	relatively high ABC rank, regional declines but increasing in MO; stable in north part of range	13	10	4.57	2.09	-3.55
Western Meadowlark	7	rangewide & MO declines	13	9	-3.51	-3.85	-5.52
Grasshopper Sparrow	7	mod. ABC rank, but strong declines in state, region, and adjacent regions	12	6	-2.12	-2.36	-4.06
Eastern Meadowlark	7	rangewide & MO declines	12	9	-2.32	-2.69	-2.57
Northern Bobwhite	7	continued declines despite habitat restoration	11	4	-3.01	-3.54	-3.21
Field Sparrow	6	mod. ABC rank, declines in MO, but habitat not lacking, also wide range	12	7	-1.79	-0.92	-1.75
Upland Sandpiper	5	increasing in some parts of range, including MO	12	11	0.72	0.76	-1.71
Dickcissel	5	relatively low ABC rank, high overall population, but neg. trends in MO	10	8	-1.35	-0.87	-1.04
Sedge Wren	4	low ABC rank, but declining in MO (small sample size); indicative of quality wet prairie habitat	8	not rated	-3.77	-4.44	1.05

# Entering a State Conservation Area



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[www.missouriconservation.org](http://www.missouriconservation.org)

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